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SCORPIONS OF THE PUERTO PEÑASCO AREA (CHOLLA BAY), SONORA, MEXICO, WITH DESCRIPTION OF *VEJOVIS BAERGI*, NEW SPECIES

By

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Abstract: The scorpion fauna of the Puerto Peñasco area was surveyed. One new species, *Vejovis baergi* was described, and four previously described species were diagnosed and discussed. A regional key to the scorpion fauna was constructed for use in either field or laboratory situations. Habitat preferences, range extensions, and unique features of the scorpion distribution are discussed in reference to the geography, physical features, and vegetational types of the Puerto Peñasco region.

Introduction

Until recent years the scorpions of Baja California, Mexico, and areas of the upper Gulf of California were unstudied. Even Pocock (1902) and Hoffmann (1931–32), in their extensive works, made little contribution to the scorpion knowledge of this area. Gertsch (1958) made the first notable contribution to the understanding of scorpion systematics of the areas of Baja California, Mexico, and the Gulf of California islands. Gertsch and Soleglad (1966) made a fine contribution with their studies on the *Paruroctonus* sub-group of the genus *Vejovis*, in that many of the species described or discussed range into areas of western Mexico. At this time, however, no extensive and comprehensive systematic study has been made on the scorpions of Baja California, Mexico, and other regions of the upper Gulf of California.

The purpose of this study is to report on the diversity and abundance of the scorpion fauna in the Puerto Peñasco area of Sonora, Mexico. One new

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species, *Vejovis baergi*, is here described and named after Dr. William J. Baerg of the University of Arkansas, who for many years has studied the biology of scorpions. In addition to the new description, four previously described species are discussed, giving information on their habitats and range extension. A key is also included for regional identification of the species in either the field or laboratory. The authors are currently conducting field studies on the ecology and behavior of the Puerto Peñasco scorpion populations.

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DESCRIPTION OF THE AREA

LOCATION. Puerto Peñasco (Punta Peñasco = Rocky Point) is located on the Gulf of California (Lat. 31°18′ N.), approximately 63 miles southwest of the border town of Sonoyta, Sonora, Mexico. The prominent volcanic headland which harbors this small fishing village is located between two large bays—Bahia

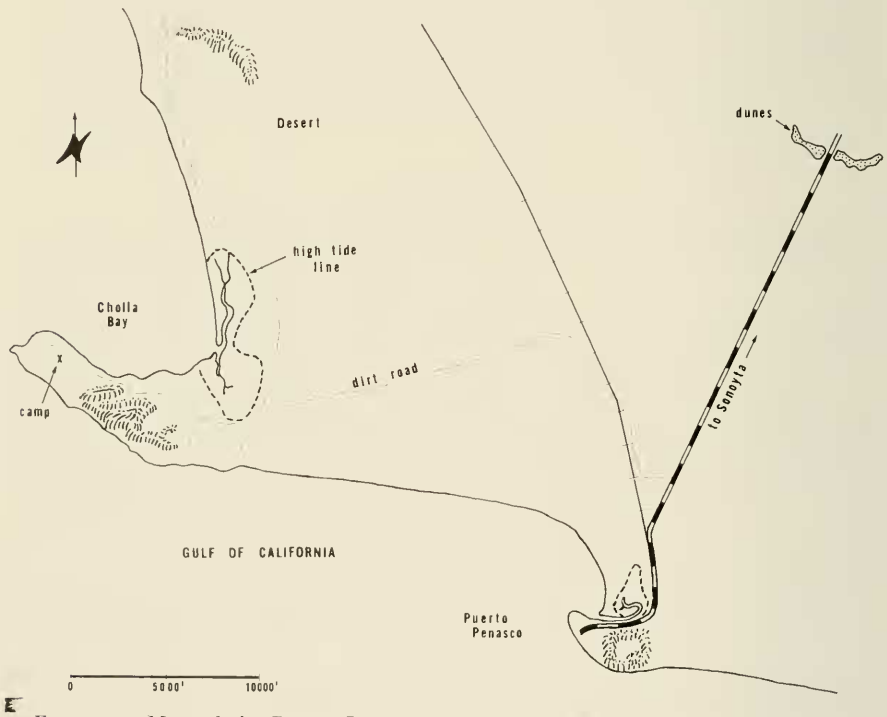

FIGURE 1. Map of the Puerto Peñasco area, Sonora, Mexico.

de Adair to the north and Bahia de San Jorge to the south. Approximately 5 miles west-northwest of Puerto Peñasco is Punta la Cholla, which can be reached from Puerto Peñasco over a dirt road (fig. 1). This area, which served as the headquarters for this study, has to its north a large tidal flat (Cholla Bay) and to the southwest a series of granitic hills. The largest of these is "Cholla Peak" with an elevation of 408 feet (Hertlein and Emerson, 1956).

Climate. The climate of this region is generally hot and dry. Although weather records from Puerto Peñasco are not available, Shreve and Wiggins (1964) indicate that the area receives less than 5 inches of rainfall annually, with the average temperature in July above 86° F. and in January between 50° and 68° F. Because of the close proximity to the Gulf of California, it is likely that the diurnal temperature extremes are somewhat moderated, and that the humidity is slightly higher than further inland. The winds off the Gulf are often very strong and have created numerous and extensive dunes, both along the shore and inland at the windward bases of mountains.

Vegetational features. The Puerto Peñasco area lies within the boundaries of the "Lower Colorado Valley" subdivision of the Sonoran Desert (Shreve and Wiggins, 1964.) The soils in this region are sandy and the vegetation sparse. Of the two dominant plant species which characterize this subdivision (*Larrea-Franseria*), only bur-sage (*Franseria dumosa* and *Franseria deltoidea*) is abundant. Two species of saltbush, *Atriplex barclayana* and *Atriplex canescens*, are common along the coastal dunes and tidal flats. Cholla, *Opuntia prolifera*, which grows abundantly on the sandy soil, serves as an excellent indicator of the extreme distances the ocean water penetrates inland during high tide. Other prominent species in the immediate area are ironwood (*Olneya Tesota*), brittlebush (*Encelia farninosa*), wolfberry (*Lycium* sp.), *Euphorbia misera*, ocotillo (*Fouquieria splendens*), *Coldenia Palmeri*, *Palafoxia linearis*, and *Frankenia Palmeri*.

Materials and Methods

Collecting trips were made to the Puerto Peñasco region in May, October, and November (1966), and January (1967). Scorpions were collected using the following methods: (1) turning surface objects such as rocks, stones, vegetation debris, and trash; (2) buried "pit-fall" traps; (3) excavation of burrows; and (4) detection by ultraviolet light at night. The ecological significance of the differences in the species of scorpions and their numbers which were collected by each of these methods will be treated in a later paper.

The measurements indicated in the description and key are standard with the exception of the scorpion's total length (distance from anterior end of carapace to the posterior tip of sting). Carapace widths were taken at the point of the median eyes.

The Scorpion Fauna

The scorpion fauna of the Puerto Peñasco area is represented by five species belonging to two families. The most prevalent family, Vejovidae, is represented by four species; the family Buthidae is represented by a single species.

The following is a key to the scorpions living in the Puerto Peñasco area:

Key to the Scorpions of Puerto Peñasco

1. Sternum triangular; subaculear tooth may be present; male cauda slender and approximately twice as long as body; reddish-orange ..... *Centruroides sculpturatus* Ewing
   Sternum not triangular, but pentagonal; subaculear tooth not present; male cauda less than twice as long as body; not reddish-orange in color 2
2. Inferior border of movable finger of chelicerae with long, dark, conspicuous tooth; fourth and fifth caudal segments, and telson bear long, reddish bristles (about 2 mm.) ..... *Hadrurus hirsutus* (Wood)
   Inferior border of movable finger without long, dark tooth—this margin either completely smooth or with several small, unpigmented and inconspicuous denticles; bristles on fourth and fifth caudal segments, and telson either absent or, if present, less than 1 mm. in length 3
3. Inferior border of movable finger of chelicerae smooth, lacking any denticles; sting well-curved—extends beyond greatest thickness of telson; bristles on telson absent or inconspicuous with unaided eye; ventral surface of telson appears to be "rough"; pedipalps elongate, not swollen in appearance; finger length more than twice the length of palm ..... *Vejovis confusus* Stahnke
   Inferior border of movable finger with several small, unpigmented denticles; sting not well-curved—does not extend beyond greatest thickness of telson; bristles conspicuous on telson with unaided eye; ventral surface of telson appears to be "smooth"; pedipalps not elongate, but with swollen hand; finger length less than twice the length of palm 4
4. Terminal tooth on inferior border of movable finger of chelicera distinctly longer than on superior border; males with 18–23 pectinal teeth, females with 14–15 teeth; telson same shade as preceding caudal segments; chela (claw) with distinctive gap at proximal end of fingers when closed ..... *Vejovis baergi*, new species
   Terminal tooth on inferior border of movable finger approximates that of the superior border in size; males with 32–39 pectinal teeth, females with 23–25 teeth; telson of a lighter shade than preceding caudal segments; chela when closed, without large distinctive gap at proximal end of fingers ..... *Vejovis mesaensis* (Stahnke)

Family Buthidae

Centruroides sculpturatus Ewing.

Diagnosis. This large slender species may be easily distinguished from the other Puerto Peñasco species by the presence of a triangular sternum, and by the subaculear tooth or tubercule on the telson. Adults may reach a length of 70 mm. The color is uniform reddish or yellowish-brown without stripes or other distinctive pigmented markings. The pedipalps are long and slender giving a graceful appearance. The movable finger of the pedipalp is noticeably longer than the carapace. The metasoma is long and slender with all inferior

keels well developed and granular. The internal margin of the pedipalp fingers carry nine oblique rows of teeth, flanked on both sides by larger granules. Pedipalp hand carries distinct granular keels. Pectinal teeth number 21–24 in females, and 25–27 in males.

Material. A total of 65 specimens were collected on 28 May, 15 October, and 11 November 1966. The specimens represented juveniles and adults of both sexes.

Distribution and habitat. This species occurs abundantly throughout Arizona where it has been reported as far north as the Grand Canyon, as far west as Yuma, and as far east as Graham County. At this time no other distributional records are known. The Puerto Peñasco populations reported here are a southern range record.

In the Puerto Peñasco area the distribution was patchy, apparently caused by the uneven distribution of suitable surface shelter. This species was most abundant under trash in coastal dumps, among sheets of sandstone, and in volcanic outcroppings. It has also invaded man-made structures including houses. Suspected habitats as far inland as 10 miles from the Gulf were not inhabited by this species. Sand flats appeared to act as barriers to the dispersal of this species, for no specimens were found in open sandy areas unless some sort of suitable shelter was near by. This species showed no affinity for burrowing.

Comment. The Puerto Peñasco specimens did not differ in any significant morphological way from topotype specimens collected at Tempe, Arizona. It is interesting to note, however, that specimens collected in the Cholla Bay dump were distinguishable from those collected under rocks at the volcanic Black Mountain about 5 miles north of Cholla Bay; the Black Mountain specimens being darker and more reddish in color.

Family Vejovidae

Hadrurus hirsutus (Wood).

Diagnosis. This species is easily recognized by its large, hairy body. Adults may reach a length of up to 115 mm. The body is a light but bright yellow, being slightly darker on the carapace and mesosoma than on the appendages. A contrastingly dark pigmented crescent passes through the interocular area on the carapace. No distinct color patterns, other than the interocular crescent, occur. The body is covered by long reddish hairs, being especially abundant on the telson, last two segments of metasoma, terminal segments of legs, brachium, and humerus. The pedipalp hands are broad and laterally compressed. The lower margin of the movable finger of the chelicerae bears one long dark tooth. The pectines are large and bear 27–29 teeth in females, and 30–39 teeth in males.

Material. A total of 20 specimens were collected on 15 October and 11 November 1966. The series was composed of adults and juveniles of both sexes.

Distribution and habitat. Specimens have been taken from western Arizona, desert regions of southern California, northern Baja California, Mexico, and Cedros Island, Baja California, Mexico.

This is a burrowing species and does not appear to need surface cover for shelter. It is able to seek shelter in mammal burrows and is also capable of rapidly excavating its own burrow. It is, however, sometimes found beneath rocks and cardboard. This species has been collected in sand dune, playa, and rocky hillside communities in desert areas. The populations of the Puerto Peñasco area reported here are a southeastern range extension record.

Vejovis baergi Williams and Hadley, new species.

Description of holotype. *Coloration*: carapace, mesosoma, metasoma, and pedipalps of uniform pale yellow; walking legs similar but lighter than pedipalps; pectines almost white. Only contrasting color markings are: eyes black, teeth of chelicerae and pedipalps reddish, aculeus dark reddish-brown, tips of pretarsal claws dark reddish-brown. Cuticle almost transparent, with heart showing dorsally; internal organs give dorsum of mesosoma a slightly darker tone. Cuticle otherwise unpigmented.

Carapace: Anterior margin straight, with six erect bristles. Lateral eyes three per group, most anterior eye in each group largest. Median eyes on raised ocular tubercule; one large, erect bristle lateral to posterior margin of each median eye; diad slightly more than ¼ carapace width at that point. Carapace surface covered with large granules, median groove long and narrow anterior

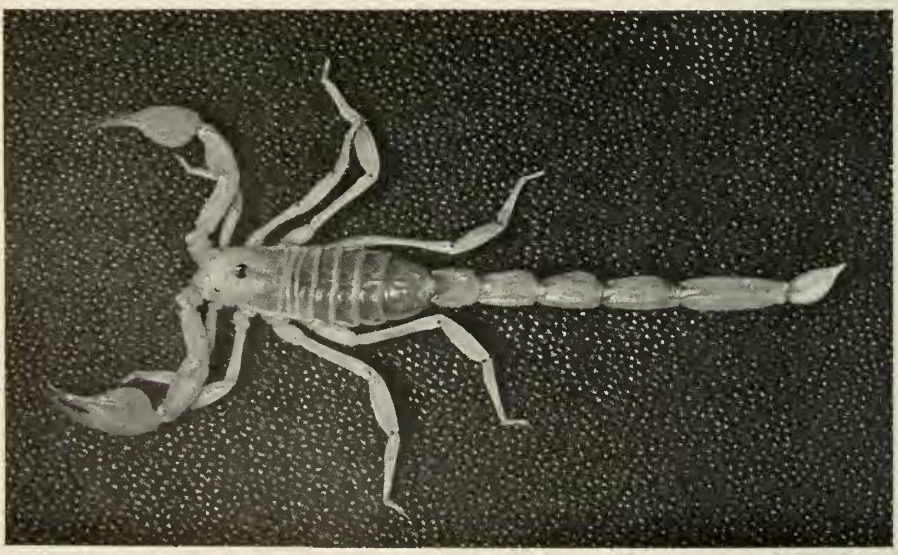

Figure 2. *Vejovis baergi*, new species. Dorsal view of holotype.

Figure 3. *Vejovis baergi*, new species. Ventral view of holotype.

to median eyes, continues over ocular tubercule, becomes deeper posteriorly, ends near posterior end of carapace.

Mesosoma: All dorsal plates densely covered by large granules; median keel of segments 3–7 smooth; segment seven with two pairs of lateral keels with large dentate granules; segments six and seven with long, erect reddish bristles on lateral margin; lateral margin of segment seven abruptly flattened horizontally and with large dentate granules. Sternites relatively smooth, surface texture uneven; one pair of keels on last sternite, with large, irregular dentate granules; lateral margin of sternites with serrate granules. Stigma long and slit-like.

Metasoma: All dorsal and dorso-lateral keels complete and with large granules giving serrate appearance, except that the dorso-laterals absent on segment five. Lateral keels present and serrate on posterior $\frac{3}{6}$ of segment one, and posterior $\frac{1}{6}$ of segments two and three, absent on segment four, present and serrate on anterior $\frac{1}{4}$ of segment five. Inferior lateral keels present and complete on all segments; segments 1–3 represented mainly as smooth carinae with a few small, irregular granules; segment four smooth with a few widely spaced granules on anterior half, posterior half with regularly spaced serrate granules on entire length. Inferior median keels on segments 1–4 complete and paired, complete and single on segment five; segments 1–3 represented as smooth carinae, segment four basically smooth but with a few granules posteriorly, segment five irregularly serrate. Inferior median keels with three or four pairs of erect reddish bristles on segments 1–4. Inferior median keel of segment five

with irregularly and broadly arranged granules. Intercarinal spaces with abundant, moderately sized granules.

Telson: Ventral side with 10 long, reddish hairs which approximate aculeus in length, and with more numerous short, whitish hairs. Vesicle basically smooth, with small broad, shield-like subaculear tubercule.

Pectines: Long and thick; 16 subcircular middle lamellae; large subcircular to triangular fulcra; 20 pectinal teeth. Inferior surface with short, red hair, especially dense on fulcra, middle lamellae and anterior margin.

Genital operculum: Completely divided longitudinally; large distinct genital papillae visible externally.

Chelicerae: Inferior border of movable finger with five small denticles; terminal tooth of superior border of movable finger much shorter than terminal tooth of inferior border.

Pedipalps: Hand swollen inwardly, all keels distinct and covered by either large rounded or sharp serrate granules. Fixed finger distinctly shorter than carapace, movable finger slightly longer than carapace. Internal margin of fingers irregularly but distinctly scalloped; teeth do not extend to proximal end of fingers. Proximal teeth do not meet in last scallop when chela closed.

Walking legs: Tibia and three tarsomeres with abundant, long reddish hairs, pretarsal claws long and curved; last tarsal segment with one row of short bristles; protarsus with two rows of short bristles.

(See table 1 for measurements, and figures 2 and 3 for photographs.)

Description of allotype. Morphologically the same as holotype with the following exceptions: slightly smaller in total length; slightly wider in carapace width; chela slightly smaller; pectine with about 25 percent fewer teeth ($^{15}/_{16}$ instead of $^{20}/_{20}$); middle lamellae fewer (12 instead of 16); with slight indication of dusky markings on anterior part of ocular tubercle; carapace and tergites not as granular; carapace slightly lustrious; pectines smaller, no genital papillae; dorsum of mesosoma slightly darker (because of internal organs, not pigmentation of cuticle). Measurements in table 1.

Variation within paratypes. Study of the 28 paratopotypes indicated little variation from the descriptions of the holotype and allotype. Sixteen males varied in total length from 42 mm. to 48 mm., while 12 females varied from 38 mm. to 52 mm. Pectine tooth count varied from 18 to 23 (mode 22) in males, and from 14 to 15 (mode 15) in females. In general, the mesosoma of females was distinctly darker than of males owing to differences in the internal anatomical condition rather than cuticle pigmentation. Juveniles were conspicuously lacking in the samples.

Type data. The holotype and allotype were collected at Cholla Bay (near Puerto Peñasco), Sonora, Mexico, 15 October 1966. Both specimens were collected in a sandy dune community during early evening by means of ultraviolet

Table 1. *Measurements (in millimeters)* of Vejovis baergi, *new species, holotype, and allotype.*

	holotype (male)	*allotype (female)*
Total length	46.0	41.0
Carapace		
Length	5.1	5.1
Width (at median eyes)	3.9	4.1
Mesosoma, length	9.2	9.8
Metasoma, length	24.5	19.5
caudal segment I		
length	2.8	2.5
width	2.6	2.6
caudal segment II		
length	3.8	3.0
width	2.4	2.3
caudal segment III		
length	4.2	3.2
width	2.3	2.2
caudal segment IV		
length	4.9	3.8
width	2.2	2.1
caudal segment V		
length	7.0	6.2
width	2.2	1.8
Telson, length	6.2	5.9
Vesicle		
length	3.7	3.7
width	2.0	2.0
depth	2.0	2.0
Aculeus, length	2.5	2.2
Pedipalp		
Humerus		
length	4.0	3.9
width	1.4	1.5
Brachium		
length	4.4	4.4
width	1.9	2.0
Chela		
length	7.5	7.5
width	2.6	2.2
depth	4.4	2.8
movable finger, length	4.9	4.3
fixed finger, length	3.5	3.4
Pectines		
teeth (left/right)	20/20	15/16
middle lamellae	16	12

light detection (figure 4). The holotype and allotype are permanently deposited in the type collection of the California Academy of Sciences.

Material. A total of 30 specimens (17 males, 13 females) were collected in a sand lot adjacent to the Cholla Bay Oceanographic Station on two dates: 15 October and 12 November 1966. Three of the specimens were taken in pitfall traps just east of Cholla Bluff in the hillside dune, and 27 were collected by ultraviolet light detection.

Comment. Morphologically, this species should be placed in the *Paruroctonus* subgenus of *Vejovis* because of the denticles on the lower border of the movable cheliceral tooth. In this subgenus, it appears morphologically closely related to *Vejovis bantai* Gertsch, but differs in the following ways: lack of heavy granulation on the inferior median keels of metasomal segment four; inferior median keels on metasomal segments one and two distinct; lack of pigmented color patterns. In gross appearance, this species also closely resembles *Vejovis intrepidus intrepidus* Thorell, but differs in pectine structure, pigmentation, size, and geographical distribution.

This appears to be mainly a burrowing species. Intensive search under rocks and other available ground cover failed to produce this species. The only specimens collected were apparently adults taken on the ground surface at night. The collection data so far available indicate an activity pattern similar to that reported for *Anuroctonus phaeodactylus* (Wood) (Williams, 1966), which is an obligate burrower.

Vejovis confusus Stahnke.

Diagnosis. Entire body and appendages uniform pale yellow, except pectines which are nearly white; fingers of chela slightly more reddish than remainder of hand; no distinctive color pattern; females with slightly darker mesosoma than males (owing to internal organs and transparency of cuticle, not to cuticle pigmentation). Carapace and tergites densely granular in both sexes, but more so in males. Sternites relatively smooth, with fine reddish hairs. Lateral keels absent on metasoma segment four. Inferior lateral keels crenate to serrate on metasomal segments 1–5. Inferior median keels of metasoma basically smooth on segment one; segments 2–3 smooth to faintly crenate; segment four crenate; segment five crenate to serrate. Ventral surface of vesicle covered with many broad, rounded granules. Pedipalps long and slender; hand keeled with rounded, sometimes indistinct granules; palm not swollen; carapace distinctly longer than fixed finger, but only slightly longer than movable finger. Chelicerae with inferior margin of movable finger lacking denticles; terminal tooth on inferior margin distinctly longer than that on superior margin. Pectines with 10 subcircular middle lamellae in males, eight in females; males with 14 to 16 (mode 15) teeth, females with 10 to 12 (mode 12) teeth. Total lengths of males approach 39 mm., females 44 mm.

Figure 4. Habitat of *Vejovis baergi*, new species, at Cholla Bay, Sonora, Mexico.

Material. A total of 34 specimens were collected in the Puerto Peñasco area on three dates: 15 October and 11 November 1966, and 21 January 1967. This series was represented by a wide variation of ages, including adults of both sexes.

Distribution and habitat. Specimens have been reported from central and southern Arizona, southeastern California, and southern Nevada. The Puerto Peñasco populations reported here are a new southern range extension.

Gertsch and Allred (1965) reported this species in a wide variety of plant communities, but as being most predominant in *Grayia-Lycium*, *Larrea-Franseria*, and mixed plant communities. In the Puerto Peñasco area, *V. confusus* was found predominantly in dune communities, both inland and coastal.

Vejovis mesaensis (Stahnke).

Diagnosis. This is a large species with slender, graceful appendages. Adults may reach a body length of up to 70 mm. The body varies in color from pale orange in juveniles to pale yellow in adults, and lacks contrasting color patterns. The pedipalps and metasoma are generally of darker color than the walking legs, but are lighter than the mesosoma. The carapace is shorter than the fifth segment of the metasoma, and is slightly shorter than the movable finger of the pedipalp. The hand of the pedipalp is swollen inwardly and thick. The underside of the metasoma is covered with abundant, short, stout reddish hair as are the distal segments of the walking legs. About three to five small unpigmented

teeth occur on the inferior margin of the movable finger of the chelicera. The pectines are almost white, bearing 23–25 teeth in the female, and 32–39 teeth in the male. The large size, pale yellow color, and thick pedipalps make this species resemble *Hadrurus hirsutus*, but is not as large, not as hirsute, and lacks the distinctive dark cheliceral tooth characteristic of *Hadrurus*.

Material. A total of 159 specimens were collected 15 October and 11 November 1966. The series contains adults and juveniles of both sexes.

Distribution and habitat. This species is reported as far northeast as Mesa, Arizona (type locality), and as far northwest as Indian Wells, Twenty-nine Palms, and Borego, California. It has also been collected in the sand dunes at Parker and Yuma, Arizona. Specimens were also taken at San Felipe, Baja California, Mexico.

In southern California it has been taken in dune, playa, and creosote-bush habitats, while at Puerto Peñasco, *V. mesaensis* was found most abundantly in coastal sand flat and dune habitats. This species spends the day in burrows of their own construction, coming out at night where they sit motionless on the ground surface. There appears to be some association with the plant *Coldenia Palmeri* Gray (Boradinaceae), since their numbers are greatest in sand habitats where this plant is abundant. At night a high proportion of these scorpions sit beneath these low growing plants.

Discussion and Conclusions

The scorpion fauna of the Puerto Peñasco area of Sonora, Mexico, may be considered rich both in the number of species present and their abundance. Five species from two families were collected on three brief survey trips within an area 5 miles in diameter. This compares favorably to the North American record in species diversity reported by Gertsch and Allred (1965), in which they reported nine species from two families collected in the Nevada Test Site (an area of more than 1000 square miles).

In addition to the discovery of one new species, *Vejovis baergi*, the Puerto Peñasco samples revealed significant range extensions for three other species, *Hadrurus hirsutus*, *Vejovis confusus*, and *Centruroides sculpturatus*. Only one species had been reported previously from this area, *Vejovis mesaensis* (Gertsch, 1958).

The generally dominant species in the area was *Vejovis mesaensis*. Over 100 specimens were collected in 2 hours at night on the surface of a Cholla Bay sand flat in an area of less than 3500 square yards. All species appeared to have a patchy distribution over the area. *Centruroides sculpturatus* was the dominant species under light-colored sandstone and black volcanic rocks, and under trash in coastal dumps. *Vejovis confusus* was the predominant species on the sand dune 5 miles northeast (inland) of Puerto Peñasco. Both *Hadrurus hirsutus* and *Vejovis baergi* were found most frequently on the sandy soils of the dune

communities, but neither was a dominant form there. It was interesting to note that *Centruroides sculpturatus* was very abundant in a coastal dump at Cholla Bay (0.1 miles from high tide mark), but was conspicuously absent in the dump at the sand dune 5 miles northeast of Puerto Peñasco.

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